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T.E. (Mechanical) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL ((2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions :
1) *Attempt **any one** question in **each** Unit.*
2) *Answer **3** questions from Section **I** and **3** questions from Section **II**.*
3) *Black figures to the **right** indicate **full** marks.*
4) *Assume suitable data, if necessary.*
5) *Solve **1** or **2**, **3** or **4**, **5** or **6**, **7** or **8**, **9** or **10**, **11** or **12**.*
6) *Answer to the Sections **I** and **II** should be written separately.*

SECTION – I

Unit – I

1. a) Differentiate between :
   i) End standards and Line standards **3**
   ii) Measurement and Calibration. **3**

   b) Differentiate between Mechanical and Pneumatic comparator. Explain with sketch the principle and working of Solex Pneumatic comparator. **10**

2. a) Sketch the setup and describe the construction as well as operating procedure for Auto-Collimator. **6**

   b) Discuss advantages and limitations of optical comparators. Explain construction and working of optical-mechanical comparator. **10**

Unit – 2

3. a) Design the GO - NO GO limit gauge for checking of a hole having size $40^{0.04}_{0.00}$ mm. Assume gauge maker's tolerance equal to 10 % of work tolerance and wear allowance equal to 10 % of gauge maker's tolerance. [Draw the diagrammatic presentation]. **10**

   b) Describe how interference bands are formed while using optical flats. Describe with neat sketch the fringe pattern obtained on various surfaces contours using interferometry. **8**

P.T.O.

4. a) Design and make drawing of plug gauge for inspection of a hole of 70 H_8. Given data with usual notations :

   Tolerance unit = i = 0.45 $\sqrt{D}$ + 0.001 D,
   Diameter step 50 to 80 mm. **10**

   b) Define terms : (i) CLA Value, (ii) RMS Value. **2**

   c) Describe with neat sketch Tomlinson's surface meter. **6**

Unit – 3

5. a) Derive an expression for best size wire and calculate diameter of best wire for $M_{20} \times 2.5$ screw. **6**

   b) Write short note on : Parkinson gear tester (Draw sketch). **6**

   c) Write a short note on : Machine vision. **4**

6. a) Explain the use of constant chord method. Derive expression as ;

   Constant chord = $\left[(\pi \times m \times \cos^2 \phi)/2\right]$

   Where, m = module and ϕ = pressure angle. **6**

   b) Write short note on Pitch measuring machine (Draw sketch). **6**

   c) Explain use of Lasers in Metrology. **4**

SECTION – II

7. Discuss following seven quality control tools used to support Quality Improvement.
   1) Check sheet
   2) Flow charts
   3) Histograms
   4) Cause and effect diagrams
   5) Pareto Analysis
   6) Scatter diagrams
   7) Control charts. **18**

OR

8. a) Discuss Deming's 14 point for achieving quality excellence. **7**

   b) Explain concurrent Engineering Product development activities. **6**

   c) Discuss Mal com Balbridge award. **5**

9. a) Explain with example following process improvement Quality tools
      a) Kaizen
      b) Poke Yoke. **8**

   b) Discuss following Quality management concepts.
      a) 5S
      b) Kanban. **8**

10. a) Discuss Failure Mode and Effect analysis to estimate the effect and seriousness of the failure take example. House hold lamp. **8**

    b) Explain in brief :
       1) TS 16949
       2) ISO 14000. **8**

11. a) Explain five steps in the DMAIC methodology in Green belt training. **5**

    b) Explain six sigma concepts developed by Toyota Motor Corporation. **5**

    c) Explain process capability index. **6**

12. a) Differentiate between single sampling double sampling, Multiple sampling, Differential sampling plan. **12**

    b) Explain OC curve. **4**